National Institute of Environmental Health Sciences

Environmental changes impacting Echinococcus transmission: Research to support predictive surveillance and control

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Abstract:

Echinococcosis, resulting from infection with tapeworms Echinococcus granulosus and E. multilocularis, has a global distribution with 2-3 million people affected and 200,000 new cases diagnosed annually. Costs of treatment for humans and economic losses to the livestock industry have been estimated to exceed $2 billion. These figures are likely to be an underestimation given the challenges with its early detection and the lack of mandatory official reporting policies in most countries. Despite this global burden, echinococcosis remains a neglected zoonosis. The importance of environmental factors in influencing the transmission intensity and distribution of Echinococcus spp. is increasingly being recognized. With the advent of climate change and the influence of global population expansion, food insecurity and land-use changes, questions about the potential impact of changing temperature, rainfall patterns, increasing urbanization, deforestation, grassland degradation and overgrazing on zoonotic disease transmission are being raised. This study is the first to comprehensively review how climate change and anthropogenic environmental factors contribute to the transmission of echinococcosis mediated by changes in animal population dynamics, spatial overlap of competent hosts and the creation of improved conditions for egg survival. We advocate rigorous scientific research to establish the causal link between specific environmental variables and echinococcosis in humans and the incorporation of environmental, animal and human data collection within a sentinel site surveillance network that will complement satellite remote-sensing information. Identifying the environmental determinants of transmission risk to humans will be vital for the design of more accurate predictive models to guide cost-effective pre-emptive public health action against echinococcosis.

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Resource Description

Exposure :

weather or climate related pathway by which climate change affects health

Meteorological Factors, Precipitation, Temperature

Geographic Feature:

resource focuses on specific type of geography

None or Unspecified

Geographic Location:

resource focuses on specific location

Global or Unspecified

Health Impact: ☑

specification of health effect or disease related to climate change exposure

Infectious Disease

Infectious Disease: Foodborne/Waterborne Disease

Foodborne/Waterborne Disease: Helminthiases

Model/Methodology: ☑

type of model used or methodology development is a focus of resource

Methodology

Resource Type: ☑

format or standard characteristic of resource

Review

Timescale: ☑

time period studied

Time Scale Unspecified

Vulnerability/Impact Assessment: ☑

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system

A focus of content